MEMORANDUM

Date: 6th April 2005
To: Task Force 1, Island Fox Integrated Recovery Team, and Land Managers
From: Island Fox Recovery Coordination Group (RCG)
Subject: Response to Analysis 1.3: *"Use the PVA models (developed in Analysis 1.1) and supporting data to determine the conditions in the wild populations that would trigger taking further foxes into captivity (e.g. during pig eradication on Santa Cruz, or if another disease outbreak occurred)"*

Summary

The island fox populations in the northern Channel Islands face high extinction risks, primarily due to predation by non-native golden eagles. The Task Force's excellent PVA modelling efforts led them to suggest increased efforts to remove golden eagles from the northern islands, including lethal control, with all foxes to be removed to captivity if the wild population on Santa Cruz Island drops below 50 animals. We fully recognize the urgent need to eliminate golden eagles from the northern islands and encourage the pursuit of this goal using all available means. Our aim is to conserve free ranging fox populations wherever possible. We argue that the decision to take additional animals into captivity should depend on the long term objectives of the captive populations and their genetic and demographic requirements, as well as on conditions in the wild. Hence, we urge the participants in the forthcoming PVA workshop to give urgent consideration to these requirements.

Introduction

We wish to thank the Task Force members, and especially Vickie Bakker and Gary Roemer, for their excellent analysis and modelling efforts. These analyses, which in the event have preceded development of the full PVA model, have not only informed the question at hand, but have also helped to develop understanding of the status of the wild population and the need for further data collection, analysis, and modelling. We note that analyses regarding the management of disease outbreaks are being submitted separately.

At the time of writing, there are about 70 known radio-collared wild foxes on Santa Cruz Island (including some <1 year old), and 8-12 golden eagles known or suspected in the northern islands. Pig eradication efforts have begun recently and are expected to lead to a fairly rapid decline in pig abundance, followed by a 2-3 year period of low but slowly declining pig density before eradication is achieved. Hence, if pig eradication influences golden eagle predation on island foxes, effects may be seen during 2005 or possibly 2006. This scenario draws attention to the urgent need for a contingency plan should there be an increase in eagle predation on foxes on any of the three northern islands.

The Task Force's analyses focused on the viability of the free-ranging population on Santa Cruz Island. Small reintroduced populations also exist on San Miguel and Santa Rosa Islands. These populations are extremely small, a fact that has two implications for PVA modelling. First, the very small population sizes mean that all projections will entail high probabilities of extinction. These circumstances make it difficult to base a recommendation on an 'acceptable' extinction probability. Second, the necessarily small sample sizes mean that up-to-date information on vital rates would have extremely wide confidence intervals, making PVA projections highly variable. When captive foxes were released on Santa Rosa and San Miguel Islands, the National Park Service adopted criteria for returning these animals to captivity; we concur with these criteria, but note that it may be appropriate to revisit these criteria, especially in the light of changing conditions, and also in response to findings from the forthcoming PVA workshop.

Findings of the analyses

We concur with the Task Force's suggestion that their PVA results be interpreted with caution. They modelled two scenarios of background mortality, one using all of the available mortality data (back to December 2000), and one using only the most recent data, which suggest higher survival rates. We note that, while these two scenarios give very different predictions, available data are not sufficient to determine which most accurately captures true fox population dynamics at present. Hence, like the Task Force, we consider it appropriate to investigate the more conservative scenario. We note that this scenario predicts population decline ($r<0$) even with no additional eagle predation.

The Task Force's analysis suggests, based on a combination of data analysis and population viability modelling, three triggers:

Tier 1: Whenever conditions are leading to a 15% extinction risk within 50 years, new efforts should be undertaken to reduce golden eagle predation.

Tier 2: Whenever conditions are leading to a 20% extinction risk within 50 years, lethal control of golden eagles should be initiated.

Tier 3: Whenever the number of collared foxes drops below 50, wild foxes should be removed to captivity.

These trigger points are based on modifications of some of the criteria used by the World Conservation Union (IUCN) to determine species' threat status for the 'red data book' [1]. We agree that these criteria are a useful starting point for such an analysis, but we do wish to note that the red list criteria were designed for use *en bloc*, not separately (as here). Hence the Task Force's findings should not be taken to imply anything about the species' red list status—in fact, IUCN already regards the entire species as Critically Endangered, the highest threat category [2].

Discussion of Task Force analyses

Tier 1

We note that, adopting the conservative estimate of 'background' mortality, even without simulating any additional mortality, the size of the population currently known (~70 radio-collared foxes) has already reached 'Tier 1'. Figure 2 of the analysis shows that the projected probability of extinction within 50 years is in the region of 15-18%. The Task Force argues that reaching this probability of extinction should trigger 'new efforts to reduce golden eagle depredation' and mentions that harassment of eagles might be carried in addition to ongoing removal efforts. Analysis 4.1 (*Assessment of golden eagle removal efforts and suggestions for future directions*) draws attention to the possibility that, while harassment might be beneficial in the short term, it could also reduce still further the success of attempts to capture golden eagles. Capture efforts are continuing with new vigor in 2005; a new contract has been drawn up that reflects the recommendations of Analysis 4.1, and it is hoped that some of the novel techniques described therein will improve eagle capture success.

Tier 2

Once again adopting the more conservative 'background' mortality schedule, we note that the projection of extinction probability based on the current known population size (15-18% within 50 years) is already close to the demographic conditions needed to reach 'Tier 2' (20% extinction probability within 50 years). The 'trigger point' would be reached with only a 'moderate' increase in golden eagle predation. If this trigger is reached, the Task Force suggests that lethal control of golden eagles should be initiated.

Permits to carry out lethal control of protected species invariably have conditions attached; however, consultations with permitting authorities indicate that it is unlikely that the use (rather than the issue) of such a permit would be contingent upon particular conditions of fox demography. Such conditions would be taken into account in determining whether a permit could be issued; another criterion would be whether non-lethal alternatives had been fully explored. Since these permitting conditions make it unlikely that lethal control of eagles could be legally implemented in response to rapid changes in fox demography, we have previously recommended that non-lethal removal of eagles be aggressively pursued—and its efficacy fully documented—during 2005.

Tier 3

The Task Force's analysis suggests that all remaining wild foxes be removed to captivity if the number of known individuals on Santa Cruz Island drops to 50. At the time of writing, the number of radio-collared animals (~70 individuals) is close to this figure.

Since (i) our aim is to conserve free-ranging foxes with the skills needed to survive in the wild; (ii) there is already a sub-population of Santa Cruz island foxes in captivity as a protection against complete extinction of the subspecies in the short term; (iii) holding foxes in captivity, whether on the island or the mainland, entails risks to the foxes such as disease outbreaks and

fire; and (iv) holding foxes in captivity is exceedingly costly; we suggest that taking additional foxes into captivity would be appropriate only if this action would increase the viability of the metapopulation as a whole (*i.e.,* including both the wild and captive sub-populations). An increased probability of extinction of the wild sub-population could argue in favour of moving *some* more animals into captivity. However, the number to be captured would depend upon the genetic and demographic requirements of the captive population. It might not be necessary to capture all the free-ranging foxes to achieve a reasonable assurance of long-term persistence for the captive population. While this would risk extinction of the wild population, such an extinction would be a certainty if all animals were brought into captivity. We note that similar arguments apply to the foxes currently free-ranging on San Miguel and Santa Rosa Islands; these populations are already small enough to reach 'Tier 3'. Hence, we consider it important that the forthcoming PVA workshop give urgent consideration to the viability of captive populations on the northern islands and determine whether it might be necessary, at some future point, to take additional animals into captivity to improve viability of the entire metapopulation.

Next steps

(1) The long-term recovery of island foxes depends upon eliminating golden eagles from the northern Channel Islands. Hence, efforts to remove all remaining golden eagles should be continued using all available means. Methods are set out in Technical Analysis 4.1, which we have endorsed. In addition, as explained in our response to Analysis 4.1, we have also sought input from golden eagle capture experts throughout the world to ensure that the methods used are those most likely to succeed within the bounds of State and Federal regulations protecting golden eagles. We plan to keep State and Federal officials fully informed of the success—or otherwise—of capture efforts.

(2) The upcoming PVA workshop should give urgent consideration to the viability of the captive populations of island foxes on the northern Channel Islands and determine whether it might be necessary, in the future, to take additional animals into captivity to ensure the population's long term genetic and demographic viability. We consider this approach preferable to the suggestion that all wild foxes be taken into captivity if their numbers fall below 50 known animals, because our aim is to conserve the wild populations where possible, and also because there are risks and costs associated with keeping foxes in captivity.

(3) Given the information currently available, we concur with the criteria adopted by the National Park Service for the return of foxes to captivity on San Miguel and Santa Rosa Islands but note that it may be appropriate to revisit these criteria in response to changing conditions and in light of the PVA workshop's findings.

1. IUCN, *The IUCN red list of threatened species*. 2002.
2. Sillero-Zubiri, C. and D.W. Macdonald, *Foxes, wolves, jackals and dogs: status survey and conservation action plan. 2nd edition.* 2004, Gland, Switzerland: IUCN.